

1995

## Comparing Self-Perceptions of Skills and Knowledge among College Students: Cross-Sectional Versus Panel Designs

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COMPARING SELF-PERCEPTIONS OF SKILLS AND KNOWLEDGE AMONG  
COLLEGE STUDENTS: CROSS-SECTIONAL VERSUS PANEL DESIGNS

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A Thesis

Presented to

The Faculty of the Department of Sociology  
The College of William and Mary in Virginia

In Partial Fulfillment

Of the Requirements for the Degree of  
Master of Arts

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by

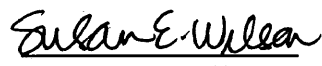
Susan E. Wilson

1995

## APPROVAL SHEET


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the requirements for the degree of

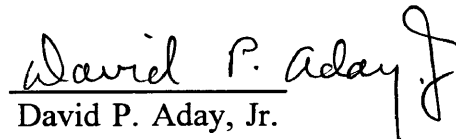
Master of Arts

  
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Approved, August 1995

  
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## ABSTRACT

The purpose of this study is to compare self-perceptions of skills and knowledge of students at a mid-sized, mid-Atlantic university from two graduating classes. The data for this study were obtained through surveys performed in conjunction with the student assessment program at the university and were collected over a period of approximately three years. This research focuses on three specific surveys administered by the assessment program: a cross sectional survey of 1992 seniors (N=290); and a longitudinal survey of 1993 sophomores and 1995 seniors (N=330). The skills and knowledge which were part of the surveys were derived from the university's statement of general educational goals.

The major findings from this study indicate that gender differences in self-perceptions of skills and knowledge are less consistent over time than are area of undergraduate major differences. This is true regardless of whether cross-sectional or panel comparisons are being made. The lack of consistency of results from the two senior classes surveyed was also surprising given that the two classes were surveyed within a period of only three years. Well over half of the items showed statistically significant differences between the two senior classes.

COMPARING SELF-PERCEPTIONS OF SKILLS AND KNOWLEDGE AMONG  
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## I. Introduction: Statement of the Research Question

The research question I address in this thesis concerns self-perceptions of specific skills and knowledge among undergraduates at a mid-sized, mid-Atlantic university. More specifically, I examine how self-perceptions of skills and knowledge change as a student advances from the sophomore to senior years. In addition to viewing these changes for students as a collectivity, I also analyze the effects of gender and area of major (humanities, social sciences, natural sciences, and business)<sup>1</sup> on self-perceptions of skill and knowledge items.<sup>2</sup>

The above question can be addressed because of several previous studies that have been done at this university from 1992 until the present. In 1992, a sample of seniors was surveyed about specific aspects of their college experience, including self-perceptions of the skill and knowledge areas that the university describe as important to a liberal education. (See Appendix 2.) This initial study was a cross-sectional design. The following year, in 1993, a sample of sophomores from the graduating class of 1995, was also surveyed regarding similar aspects of their college experience. The results from these two surveys were then compared to determine similarities and differences between 1992

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<sup>1</sup> Appendix 1 lists 25 specific undergraduate majors within each of the four broad areas of major.

<sup>2</sup> Appendix 2 lists the skills and knowledge items to be addressed. They area derived from the university's statement of general educational goals found in Appendix 3.



senior and 1993 sophomore respondents (Bosworth 1993). The same group of students who were surveyed in 1993 as sophomores were surveyed twice again: in 1994 as juniors and in 1995 as seniors. Because the same students from the graduating class of 1995 have been surveyed at three separate points in time, the collected data constitute a panel design. The previous cross-sectional and panel design surveys allow for two specific types of analyses. First, it is possible to compare two cross-sectional studies (1992 and 1993 surveys) with subsequent panel data, to determine if similar inferences can be drawn about student self-perceptions over time. The principle focus in this research will be gender and area of major effects on self-perception. Second, data on senior classes from different graduating years (1992 and 1995) can be compared on their own terms to determine consistency of results in the senior year. I employ the method of formal hypothesis testing to complete these two types of analyses.

Once again, the proposed study provides the opportunity to explore in detail the independent variables of gender and area of major with the dependent variables of self-perception. Gender is an important attribute in any type of sociological analysis, because often by examining this master status significant differences among individuals are found (Astin and Kent 1983; Licht, Stadter, and Swenson 1989; Zuckerman 1980). As discussed below, area of major has not received as much attention as gender in the research literature, but it is important to find out whether students of different majors are perceiving their general skills and knowledge differently. Some of the skills and knowledge items included in the surveys may reflect greater specialization than other items, and therefore students may have higher self-perceptions on particular items related

to their area of study (Kreps 1992). The surveys which will be analyzed are part of the university's educational assessment program, which measures students' experiences and outcomes. The sections that follow will discuss in detail the background of the assessment program, relevant literature, formal hypotheses, research design, and the findings from the study.

## II. Background of the Assessment Program

The studies referred to below are all part of the university's assessment research which began in 1987 as part of a state mandated program. An Assessment Steering Committee, consisting primarily of university faculty, is in charge of this program. Some of the earliest work done by this committee included the development of a formal statement of general education objectives (see Appendix 3). In subsequent research the committee has focused primarily on the knowledge and skills components of these objectives. In 1991, the committee administered a historical knowledge test to about one-third of the senior class (N=331). After analyzing the results of this test, the Assessment Steering Committee concluded that the findings have some implications for general education at this university that needed to be explored further. Students' self-perceptions of skills and knowledge were areas the Assessment Steering Committee felt deserved attention through research.

The specific skills outlined from the goal statement include those of writing, foreign language, mathematics, leadership, computer, interpersonal, library, scientific method, historical inquiry, critical thinking and aesthetic skills. The specific areas of knowledge outlined in the goal statement include knowledge of philosophical and religious systems, natural sciences, Western and non-Western societies, politics, leading historical figures, movements in art, music, and literature, social and behavioral sciences, and wars and revolutions. These areas of skills and knowledge are identified as important

for students to develop and/or retain as a result of their liberal education at the university. This goal statement was the initial product of the assessment program in 1987, and has also guided efforts to assess student outcomes in earlier surveys. Therefore, this goal statement preceded the formulation of the current instrument.

The areas of skills and knowledge identified in the goal statement are incorporated as questions in the assessment surveys. These surveys address self-perceptions of skills and knowledge in the following way: "[The university] lists the following skills as goals of general education. Please rate each one on a scale of 1 to 5, with 1 meaning you believe your skills level is low, to 5, meaning you believe your skill level is high" (Kreps: Sophomore Survey Instrument 1993:5). Similar wording is used to ask students about particular "broad areas of knowledge." It is important to note that the way the question is asked in the surveys is designed to determine how confident an individual is with respect to the specific areas of skills and knowledge. From the wording of the questions, it is clear that one's perception is what is being sought, which may or may not differ from an individual's actual skill or knowledge level.

### III. Literature Review

In this section, I provide a background of the research literature as it has been addressed in the following categories: a conceptual framework which will ground this study in the research literature, studies showing the value of using self-reports as a methodology, empirical studies focusing on gender, and empirical studies focusing on area of major.

#### A. Conceptual Framework

Before turning to a brief review of the empirical literature on gender and area of major differences, it is useful to construct a conceptual framework that can account for why the results of the present study are significant. The framework employed emphasizes the effects of differential socialization by gender.

There is a large body of feminist literature which attempts to show that gender differences in self-perceptions exist, and then to explain possible reasons why they exist (Conover 1988; Gilligan 1982; Baxter Magolda 1992; Thomas 1990; Belenky, Clinchy, Goldberger, and Tarule 1986; Maccoby and Jacklin 1974; Safir 1986). One of the primary explanations given is differential socialization (Gilligan 1982; Baxter Magolda 1992; Weidman 1989; Thomas 1990). Socialization takes place in a variety of settings, and individuals can be influenced by a number of sources, including parents, peers, educational institutions, and the larger society. Examining how each of these sources may affect males and females differently may help to explain some of the gender differences

found in this research.

At the outset, it is necessary to have a clear definition of socialization in mind. John Weidman, whose work focuses on the theory of socialization, has written that "socialization involves the acquisition and maintenance of membership in salient groups (e.g., familial, occupational, organizational) as well as society at large" (1989:88). Not all members of society experience socialization in the same way, and gender is a key status characteristic which can affect the socialization process (Weidman 1989; Baxter Magolda 1992; Gilligan 1982). For example, in a naturalistic study of college students which examined their ways of reasoning, Baxter Magolda (1992) found gender-related patterns of socialization. Specifically, she found that women students were more likely to suppress their "voices" or opinions than men students. Part of her explanation for this finding is attributable to female students being subordinated on two levels, as women and as students. In contrast, male students are subordinate only in their student status. Carol Gilligan's (1982) work also highlights how, even as children, boys are socialized to be more competitive, whereas girls develop a sense of inferiority. One result of this differential socialization is that men and women have "fundamental value differences" (Conover 1988:987). It is suggested that these differences emerge as a result of the different roles played by men and women in society. These different roles are ultimately products of socialization. I begin with the socialization provided by the family.

The socialization provided by parents can greatly affect an individual, and serve as the basis for some gender differences. The influence of parents is perhaps strongest during the earlier years of the individual's life, but it continues to be significant

throughout college (Pascarella and Terenzini 1991:57). There is evidence to suggest that boys receive a more intense socialization experience than girls, and within this process of socialization, boys receive more feedback (Maccoby and Jacklin 1974). Additionally, the literature suggests that "sex differences in self-confidence tend to emerge when past performance feedback has been infrequent or ambiguous" (Licht, Stadter, and Swenson 1989:258). Because boys receive more consistent feedback, this may serve to increase their levels of self-confidence, whereas for girls, not receiving feedback may be detrimental to their self-confidence. There is also evidence to suggest that parents' perceptions of their child's skill and ability can affect the child's perception of his or her own skills and ability. For example, Eccles and Jacobs (1986) found that sex differences in math attitudes and achievement could be partially attributed to gender-stereotyped beliefs of parents: when parents were informed through the media that boys were better than girls at math, many of the parents assumed their sons and daughters also fit into that stereotype. The attitude of parents was transmitted to and held by their children.

The second area of socialization concerns that which occurs within the formal education system, from primary to postsecondary schooling. At the primary education level, the literature suggests that girls and boys exhibit some significant differences that can at least partially be linked with differential socialization that occurs cross culturally. Safir's (1986) research compared students growing up in Israel with students from the United States, and found gender differences in verbal ability were not constant across cultures. Safir found that in terms of skills, Israeli children show fewer gender differences, while far more gender differences exist in the United States, and mostly in

favor of males. One specific finding of Safir's research was that Israeli boys exhibit stronger verbal skills than Israeli girls, while in the United States, girls' superior verbal skills have been well documented (Maccoby and Jacklin 1974:75; Safir 1986). This research is important because it demonstrates that the learning of at least some skills are the result of cross-cultural socialization influences, as opposed to purely biological influences. The explanation provided by Safir was that patriarchal societies tend to favor males, and egalitarian societies (as found in Israel) tend to minimize gender differences.

Focusing on gender differences in the United States, manifestations of lower self-confidence in female students is illustrated through trends such as "math anxiety" shown by females (Haertel, Walberg, Junker, and Pascarella 1981; Eccles and Jacobs 1986). When females experience math anxiety, they may avoid taking math courses, or perceive themselves to be inadequate in that particular area. Math anxiety may be caused by girls' lower expectancies (Vollmer 1986) or lower expectations from their parents (Eccles and Jacobs 1986) when compared with boys.

Another way that gender differences are manifested at the primary and secondary levels is through attributions of failure. Girls are more likely to attribute their failures to a lack of ability, whereas boys are more likely to attribute their failures to external factors, such as a poor instructor (Licht, Stadter, and Swenson 1989; Dweck, Goetz, and Strauss 1980). Boys also recover more quickly from their failures than girls (Dweck, Goetz, and Strauss 1980), and may have higher scores because they are more likely to "guess" at answers (Gossweiler and Slevin 1995; Safir 1986). On the other hand, girls are likely to attribute their successes to the task being "easy" (Licht, Stadter, and Swenson



1989). One potential explanation for gender differences in attributions of failure is that boys receive more feedback than girls in the classroom, which has a positive effect on their levels of self-confidence. Additionally, the research literature has documented that boys receive not only more feedback in the classroom than girls, but also that they receive more interaction and attention from their teachers (AAUW Summary 1992). Both of these processes may serve to elevate boys' levels of self-confidence while maintaining or lowering girls' self-confidence.

There is also evidence to suggest that there are significant gender differences with regard to individuals' self-concepts. It has been documented throughout the literature that females develop a sense of inferiority and have lower self-esteem than males, at nearly all levels of education, beginning as early as elementary school and continuing throughout college (Gilligan 1982; Thomas 1990; Maccoby and Jacklin 1974; Licht, Stadter, and Swenson, 1989; Dweck, Goetz, and Strauss 1980). This sense of inferiority which females develop may be partially attributable to less feedback and lower expectations.

Aside from the differential socialization experienced by males and females in primary and secondary education, there is evidence of the same process in higher education as well. As Weidman suggests, "Socialization in higher education can thus be viewed as a process that results from the student's interaction with other members of the higher education environment in groups or other settings characterized by varying degrees of normative pressure" (1989:96). By this definition, socialization within formal education occurs most notably through the peer group and faculty interactions. Astin (1993) found that the peer group was one of the most potent sources for socialization in

higher education.

According to some feminist writers, even in higher education subject segregation by gender exists in order to maintain occupational segregation outside of the institution (Thomas 1990). The way that this subject segregation is manifested is through the sharp distinctions between humanities and the "sciences," specifically referring to physics, chemistry, and biology. However, it should be mentioned that there is a hierarchical structure with respect to prestige and difficulty within the natural sciences. Physics is viewed to be the most difficult and challenging of the natural sciences, followed by chemistry, and finally, biology (Thomas 1990). The assumption is that physics is the most encompassing of all three branches of natural sciences, and knowledge of biology and chemistry is assumed. Similarly, a certain amount of knowledge of the biological sciences is assumed when studying chemistry. However, biology is viewed as the least encompassing and least difficult of the natural sciences. Thomas's (1990) research shows that in general women are overrepresented in humanities, while men are overrepresented in the sciences. The data for students in the present study suggest this as well: the clear majority of humanities majors are women, and women majoring in the natural sciences are disproportionately biology majors.

Thomas (1990) argues that this imbalance is at least partially due to the social construction of humanities as a less difficult and challenging field than the sciences. For those women who do "break the barrier" and attempt to study one of the natural sciences, they are faced with a new set of dilemmas, including how they will maintain their femininity. The following passage illustrates this point well: "The certainty of physics,

so important to men, inspires less confidence in women because it depends on a negation of femininity, of those qualities which are socially acceptable but not intellectually acceptable" (Thomas 1990:176-177). According to some feminist theorists, there will always be some sort of obstacle to be faced by women who are attempting success in any traditionally masculine domain (Gerson and Peiss 1985), and this example illustrates the continual dissonance felt by many women. Thomas (1990) concludes that higher education serves to marginalize and alienate women.

The larger society and the cultural expectations within it serve as a source of socialization which can have far-reaching effects on perpetuating gender differences. One of the classic dilemmas faced by women is how they will manage having both a career and a family, if both are desired. Until recently, it has been expected that women would place family priorities ahead of career advancement, but this is changing as more women are working in traditionally male careers. One way to conceptualize more clearly the dilemma faced by many women today is to explore traditional definitions of femininity. As alluded to in the previous paragraph, often "femininity" is defined by women being subordinate to men and remaining in an intellectually inferior position (Thomas 1990). As a result, women must decide whether to maintain their "femininity" or to become successful (Gilligan 1982) or clever (Thomas 1990). Women will sometimes even go so far as to "play dumb" when interacting with men to preserve traditional feminine identities (Thomas 1990). The consequence of women becoming successful in a career, acting intelligently, or being competitive often results in being defined as "unfeminine" and may ultimately lead to social rejection (Gilligan 1982; Thomas 1990).

These trends, taken together, suggest that in general females have lower self-confidence than their male counterparts. The literature also suggests that most of these differences may be explained through differential socialization from many sources, including the family, peer group, educational institutions, and the larger society.

#### B. The Value of Using Self-Reports

Although the theoretical and empirical literature suggests that women have lower self-confidence, there is much literature confirming the value of using self-reports to offer a balance to the argument. First, however, Astin (1993) defines self-perceptions in terms of college students. He suggests that self-perceptions are part of students' noncognitive psychological development, whereas skills and knowledge are part of students' cognitive psychological development. Noncognitive, or affective outcomes refer to "the student's attitudes, values, self-concept, aspirations and everyday behavior" (Astin 1993:9), whereas cognitive outcomes "involve the use of higher-order mental processes such as reasoning and logic" (Astin 1993:9). This study may reveal significant relationships in terms of these two broad areas of student development. In Astin's terms, the study utilizes a noncognitive approach to assess cognitive outcomes.

Known for their research on multiple aspects of the college experience, Pascarella and Terenzini (1991) suggest several ways that have been used to assess skill and knowledge outcomes among college students. Their list includes "individual self-reports of gains in general and specific dimensions of academic knowledge and skills" (62). This is similar to the methods employed in the present study. If self-reports of respondents as opposed to objective tests are used, researcher bias through the construction of items on

an instrument has a smaller chance of influencing the data. Objective tests may be defined as tests for which there are predetermined "correct" responses, as in the case of multiple choice tests. Objective tests are designed so that answering questions correctly necessarily indicates specific knowledge of a particular area. As Berdie's research confirmed, "Students' responses to the test items cannot provide an absolute indication of their knowledge or lack of knowledge" (1971:632). This finding is confirmed by Gossweiler and Slevin (1995), who also argue that objective tests are gender biased, negatively affecting women. Therefore, the primary reason researcher bias is less likely to enter the data is because self-reports of skill and knowledge areas are more broad and encompassing, and there are no right or wrong answers.

Several researchers (Berdie 1971; McMorris and Ambrosino 1973; Canter and Meyerowitz 1984) have advocated the method of self-reports as an alternative means of gathering relevant information. Self-reports provide more complete and differentiated information concerning gender differences than do other approaches that examine the characteristics researchers attribute to respondents (Canter and Meyerowitz 1984). Another advantage in using a methodology relying on self-reports as opposed to objective tests is that asking individuals about their knowledge relieves students of any test-taking anxiety, and is a non-stressful situation (Berdie 1971; McMorris and Ambrosino 1973). One study addressed the question of whether self-reports were equally valid for men and women (Berdie 1971). Berdie's study surveyed two samples and he analyzed each sample by gender. His analysis reports no significant differences between the men's and women's self-reports. Additionally, students have been found to be relatively accurate concerning

their self-perceptions of academic performance (Astin 1993; Bosworth 1994; McMorris and Ambrosino 1973; Pascarella and Terenzini 1991). Therefore, it is reasonable to assume that they can also accurately perceive and report their levels of skills and knowledge. The key point is that although the literature suggests that women have lower levels of self-confidence, self-reports are a valid methodology.

Since self-reports of skills and knowledge will be used in this study, some of the gender and area of major differences regarding self-perceptions reported in the research literature will be examined in the next two sections.

### C. Empirical Studies Focusing on Gender

There have been many empirical studies focusing on gender and students' self-perceptions of skills and knowledge. One specific study found that men rated themselves higher in terms of math/science ability, leadership/public speaking ability, and coping/self-sufficiency (Zuckerman 1985). Other research revealed that college men surveyed in two separate years, 1971 and 1980, consistently rated themselves higher than college women on eight of the eleven traits evaluated in the particular study (Astin and Kent 1983). The only item on which females consistently gave themselves a higher rating was artistic ability. The eight areas in which males rated themselves higher in both years include leadership ability, mathematical ability, overall popularity, popularity with the opposite sex, public speaking ability, intellectual self-confidence, social self-confidence, and writing ability. With respect to leadership ability, the literature reveals that women are less likely to hold leadership positions if they attend a coeducational university (Astin 1993).

As mentioned earlier, previous studies at this university have revealed some interesting gender differences in self-perceptions. For example, data from a 1992 survey of seniors revealed that, compared with women, men are more likely to rate themselves as having higher levels of computer skills and more knowledge about politics, and wars and revolutions (Kreps 1992). Compared with men, women in this same survey rated themselves higher in foreign language skills, interpersonal skills, knowledge about master movements in the arts, music, literature, and knowledge of social and behavioral sciences (Kreps 1992). Combining the data from the 1992 Senior and 1993 Sophomore Surveys, there seems to be fewer gender differences of self-perceived skill and knowledge levels among seniors than among sophomores (Bosworth 1993).

Astin observes from his national longitudinal studies of college students that higher education in the United States is "better-suited to enhancing the Intellectual Self-Esteem of men than of women" (1993:135). There is a general tendency for men to view themselves as "more active, independent, superior, and self-confident," while women see themselves as being "more gentle, helpful, understanding and warm" (Vollmer 1986:351). The literature also suggests that men have a tendency to exaggerate their perceptions of knowledge, whereas women are less confident (Slevin and Aday 1993). Some studies examining the expectancies of test scores among men and women have found that men expect to attain higher scores than do women (Ryujin and Herrold 1989; Vollmer 1986). However, this difference in expectancy is not attributable to any more preparation or effort on the part of men (Vollmer 1986). Moreover, studies have also found that men and women do not differ in terms of the actual grade received (Vollmer 1986; Ryujin and

Herrold 1989).

Other studies utilizing self-reports have found that college age males have higher levels of self-esteem and self-confidence in areas outside of an expected test score (Zuckerman 1985; Smart and Pascarella 1986; Astin and Kent 1983; Poole and Evans 1989). Poole and Evans (1989) found that males' self-ratings were significantly higher in terms of life skill areas. The difference in this study may be due to the males' perceptions of greater academic ability, better health, greater overall success, and greater influence over others in this sample (Poole and Evans 1989). Women's more modest self-assessments of knowledge are perhaps a reflection of their generally lower self-esteem and confidence (Poole and Evans 1989; Zuckerman 1985). However, in at least one study of students at highly selective colleges and universities, women rated themselves equal to men in terms of intelligence and self-esteem, although men still rated themselves as being more physically attractive (Zuckerman 1980). The near equal self-ratings reported by men and women from highly selective universities suggests that students, particularly women, at these institutions may hold more egalitarian attitudes than do the general population of college women.

Another area of research has focused on charting men's and women's self-concept development throughout college. Smart and Pascarella (1986) found that attending college enhances the self-concept of both men and women. Although both genders gain an enhanced self-concept over time, women begin college with lower levels of self-esteem, and their self-concept continues to lag behind their male counterparts (Smart and Pascarella 1986; Astin and Kent 1983). One problem illustrated by the previous examples



is unique to self-reporting procedures--confidence does not necessarily mean competence. In other words, men and women may actually be more equal regarding competence at particular tasks or skills and knowledge, but men may be more confident in their self-perceptions when asked to rate themselves.

The research literature is less conclusive with respect to gender differences in the self-perceptions of life goals, such as education, family, and career aspirations and pursuits. In one study, males were more likely than females to adopt a more traditional view of specific life domains, such as education, health, biological needs, leisure, and family (Blais, Vallerand, Briere, and Gagnon 1990). In contrast, the females adopted "an androgynous orientation in their view of the significance of life domains" (Blais, Vallerand, Briere, and Gagnon 1990:210). However, a separate study testing similar concepts found that men and women do not differ significantly in their life goals of education, career, marriage and family (Zuckerman 1985). As this section suggests, there is both agreement and disagreement in findings when previous studies are compared with research from this university.

#### D. Empirical Studies Focusing on Area of Major

"Area of major" differences in self-perceptions are less well documented than are gender differences. The four areas of major considered in the present study are social science, humanities, natural science, and business. The sample was stratified by gender, but the proportions of students majoring in the above four areas are also representative of this population as a whole. Related studies within the university's assessment program have focused on an individual's area of major. One study compares how knowledgeable

or competent students of different majors feel in discussing certain contemporary issues (Bosworth 1994). In Bosworth's study, students of different majors were interviewed by telephone regarding eleven prominent social issues. Students were asked how comfortable they would be in discussing each of the issues with other students. Some statistically significant differences were revealed when controlling for gender, area of major, grade point average, and reading habits. In the analysis, dummy variables were used which compared social science concentrators with the three remaining areas of major (humanities, natural science, and business). The results using this type of analysis revealed the following: natural science majors had higher self-confidence in discussing genetic engineering and protecting the environment; business majors were more self-confident discussing the recession; and humanities majors felt they would be more informed in discussing abortion and freedom of expression in the arts. Conversely, natural science majors felt less confident to discuss presidential politics, while business majors felt less confident to discuss political changes in the former Soviet Union. Humanities majors and social science majors expressed relatively similar levels of confidence in discussing the specific topics of discourse.

In evaluating self-perceptions of skills and knowledge among students of different majors, the logical argument is that individuals will rate themselves more highly for those skills and knowledge areas closely related to their majors. Astin summarized this general trend by documenting that, in general, students "learn what they study" (1993:217). The historical knowledge test administered at this university in 1991 provides support for this finding. After analyzing the scores students received on this test, scores were positively

affected by the number of Advanced Placement credits earned in history and the number of history courses taken (Gossweiler and Slevin 1995).

Astin (1993) is one of the few researchers who has studied how self-perceptions of skills and knowledge are affected by area of major. The overall results from his national large scale study reveal that area of major enhances knowledge and skills in the particular areas in which the major is focused. For example, verbal skills are enhanced by majoring in social science, while quantitative skills are enhanced by majoring in math and science (Astin 1993:217-221). Another claim in support of his general conclusion that students "learn what they study" is that "self-rated writing skills are enhanced by taking courses that emphasize writing and are diminished by taking courses in science and math" (Astin 1993:130). There are other specific skills and knowledge measured in both Astin's study and in this study. Astin's (1993) study revealed that those majoring in social science and humanities experience positive effects in terms of writing skills. His study also found that majoring in science had a negative effect on self-perceptions of public speaking ability (Astin 1993:232). Another finding from the literature indirectly related to area of major is that women scientists have relatively high levels of self-esteem, compared with other groups of women included in the study, such as professionals, college students, and victims of domestic violence (Long 1991). Women majoring in the natural sciences may also have higher self-perceptions of skills and knowledge due to their higher levels of self-esteem than do women students of other majors.

Findings from research at this university (Kreps 1992; Bosworth 1993) support Astin's (1993) work: that area of major affects self-perceptions on particular skill and

knowledge items. For example, compared with seniors in other major fields, humanities majors were likely to have higher self-perceived writing, library and aesthetic skills, and lower self-perceptions of skills relating to math, computers, and scientific method. The areas of knowledge in which humanities majors have high self-perceptions include philosophical and religious systems and master movements in art, music, and literature. Other findings from these studies indicate that natural science majors have higher self-perceptions of their knowledge of natural science, mathematical skills, and scientific method skills than do those majoring in other areas. Natural science majors have lower self-perceptions of skills in speaking, writing, leadership, historical inquiry, and aesthetic skills, and in knowledge of Western societies, politics, leading historical figures, and wars and revolutions. Business majors rated themselves as having higher computer, speaking, and leadership skills than did those majoring in other areas. The business majors, however, rated themselves lower than those from other majors in terms of library and critical thinking skills, and in knowledge about philosophical and religious systems, non-Western societies, and movements in art, music, and literature. Social science majors rated themselves higher than did those majoring in other areas in terms of historical inquiry skills, in knowledge about Western and non-Western societies, politics, leading historical figures, social and behavioral sciences, and wars and revolutions. The differences among students were more noticeable in comparing area of major than gender (Kreps 1992; Bosworth 1993).

In addition to the research at this university, some general trends concerning the amount of self-perceived gain in knowledge and skill areas among college students have

been revealed through Astin's (1993) research. First, with the exception of foreign language skills, a gain is documented in every area of skill and knowledge over time (Astin 1993). In simpler terms, the more years of college completed, the more the student is likely to report growth. The skill areas showing the least amount of gain over time include writing, public speaking, and foreign language (Astin 1993). Earlier cross-sectional assessment studies at this university comparing 1992 seniors with 1993 sophomores have also documented this trend (Bosworth 1993). Secondly, in Astin's study (1993), students tend to evaluate their knowledge as experiencing more growth than their skills. One key difference between the studies done at this university and Astin's study (1993) is that Astin's research is a longitudinal study drawn from a national sample, while this university's research has been internally focused and, until 1994, cross-sectional.

The findings which relate directly to the assessment data concerning gender and area of major inform and are informed by the research literature discussed above. In tandem, they provide the foundation for the formal hypotheses of this research.

#### IV. Formal Hypotheses

The broader research literature discussed above and findings from two previous cross-sectional studies (1992 Senior and 1993 Sophomore Surveys) allow us to derive formal hypotheses about self-perceptions of skills and knowledge over time. These hypotheses can be tested with data from a panel study of the graduating class of 1995 (data on the same students during the sophomore and senior years).

Additionally, an hypothesis will be derived which compares each of the two senior classes (from 1992 and 1995) on their own terms.

##### A. Gender Hypotheses

Comparisons of 1992 seniors with 1993 sophomores are the basis for hypotheses related to gender. The relevant data from the 1992 Senior and 1993 Sophomore Surveys are shown in Table 1.

The data from Table 1 indicate fewer statistically significant gender differences for seniors than for sophomores. Specifically, the table indicates that during the sophomore year nine out of fourteen skill and knowledge areas showed statistically significant gender differences. But during the senior year, only four of fourteen areas showed significant gender differences.

The mean scores in the table indicate further that during the sophomore and senior years, men consistently rated themselves as having greater computer skills. Women consistently rated themselves as having more knowledge about movements in art, music,

**TABLE 1**  
**SOPHOMORE (1993) AND SENIOR (1992) CLASS SAMPLES:**  
**COMPARISON OF MEANS ON GENERAL EDUCATION SKILLS**  
**AND KNOWLEDGE BY GENDER**

	SOPHOMORES (N=402)			SENIORS (N=290)		
<b>SKILLS</b>	<b>GENDER</b>			<b>GENDER</b>		
	MEN	WOMEN	SIG.	MEN	WOMEN	SIG.
Effective writing	3.59	3.65	NS	3.94	4.02	NS
Effective speaking	3.38	3.18	.03	3.55	4.02	NS
Mathematical	3.26	3.07	.09	3.02	2.91	NS
Leadership	3.44	3.45	NS	3.67	3.63	NS
Computer	2.76	2.37	.00	2.79	2.56	.10
Interpersonal	3.86	3.86	NS	3.90	4.15	.01
Critical thinking	3.84	3.64	.01	4.17	4.04	NS
Aesthetic	3.12	3.40	.01	3.28	3.38	NS
<b>KNOWLEDGE</b>	<b>GENDER</b>			<b>GENDER</b>		
	MEN	WOMEN	SIG.	MEN	WOMEN	SIG.
Philos/religious systems	2.70	2.60	NS	2.89	2.65	NS
Natural sciences	3.21	2.99	.04	2.79	2.85	NS
Non-Western societies	2.55	2.43	NS	2.42	2.63	NS
Leading historical figures	3.38	3.07	.00	3.46	3.32	NS
Art/music/literature	2.59	3.14	.00	2.81	3.26	.00
Social/behavioral science	2.96	3.17	.03	2.83	3.32	.00

Skill and Knowledge Levels: 1 = low to 5 = high

NS= difference is not statistically significant at the .10 level (T-tests)

Source: Bosworth (1993), 1992 Senior Survey and 1993 Sophomore Survey

and literature, and the social and behavioral sciences. This table forms the basis for my gender-related hypotheses.

H1: Overall, there will be fewer statistically significant differences between men and women during their senior year than there were during their sophomore year, with respect to knowledge and skills items on the surveys.<sup>3</sup>

I further hypothesize that there will be some statistically significant differences between men and women that will persist in the senior year. These are as follows:

H2: Men will rate themselves higher than women on computer skills;

H3: Women will rate themselves higher than men on knowledge about master movements in the arts, music, and literature; and

H4: Women will rate themselves higher than men on knowledge about the social and behavioral sciences.

#### B. Area of major hypotheses

The results from the comparison of the 1992 senior and 1993 sophomore data focusing on area of major differences form the basis for my hypotheses and are shown in Table 2.

With the exceptions of leadership and interpersonal skills, the data from Table 2 indicate statistically significant differences on every item by area of major during the

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<sup>3</sup> There are some skill and knowledge areas which I do not predict will show significant gender differences. These specific skill and knowledge items are writing, speaking, mathematical, leadership, interpersonal, critical thinking, aesthetic skills, and knowledge of philosophical and religious systems, natural science, knowledge of non-Western societies, and knowledge of leading historical figures.



**TABLE 2**  
**SOPHOMORE (1993) AND SENIOR (1992) CLASS SAMPLES:**  
**COMPARISON OF MEANS ON GENERAL EDUCATION SKILLS AND KNOWLEDGE**  
**BY AREA OF MAJOR**

SKILLS	SOPHOMORES (N=402)					SENIORS (N=290)				
	I	II	III	IV	SIG	I	II	III	IV	SIG
Effective writing	4.12	3.69	3.41	3.15	.00	4.54	4.06	3.51	3.53	.00
Effective speaking	3.44	3.37	3.07	3.25	.06	3.64	3.60	2.92	3.72	.00
Mathematical	2.61	2.90	3.72	3.58	.00	2.19	2.75	3.86	3.53	.00
Leadership	3.45	3.52	3.35	3.40	NS	3.54	3.75	3.45	3.94	.03
Computer	2.12	2.51	2.67	3.20	.00	2.10	2.57	3.06	3.38	.00
Interpersonal	3.91	3.90	3.80	3.67	NS	3.97	4.10	4.02	4.00	NS
Critical thinking	3.75	3.82	3.74	3.46	.04	4.27	4.11	4.14	3.56	.00
Aesthetic	3.89	3.30	2.98	3.06	.00	3.91	3.23	3.06	3.09	.00
KNOWLEDGE	I	II	III	IV	SIG	I	II	III	IV	SIG
Philos/religious systems	2.94	2.78	2.42	2.35	.00	3.42	2.81	2.37	1.97	.00
Natural science	2.58	2.84	4.05	2.63	.00	2.17	2.63	4.18	2.19	.00
Non-Western societies	2.75	2.69	2.14	2.46	.00	2.50	3.01	1.95	1.94	.00
Leading historical figures	3.34	3.51	2.82	3.06	.00	3.52	3.74	2.71	3.06	.00
Art/music/literature	3.73	2.94	2.51	2.38	.00	4.02	2.86	2.72	2.63	.00
Social/behavioral sciences	3.16	3.24	2.88	2.75	.00	2.92	3.33	2.94	2.97	.03

Area of major: I = humanities, II = social science, III = natural science, IV = business  
 NS = differences are not statistically significant at the .10 level (One-way analysis of variance)  
 Source: Bosworth (1993), 1992 Senior Survey and 1993 Sophomore Survey

sophomore and senior years. Leadership skills showed statistically significant differences only during the senior year.

I derive my hypotheses for area of major differences by comparing the mean scores of sophomores and seniors in Table 2.

H5: The statistically significant differences by area of major found to be consistent in the 1992 senior data and the 1993 sophomore cross-sections will also be found in the 1995 senior data of the panel study.

I further hypothesize that there will be statistically significant differences among the four areas of major in almost all of the skill and knowledge items.<sup>4</sup> Both highest and lowest mean scores are specified when they are distinct outliers. I expect statistically significant differences during the senior year in the following areas relative to area of major:

H6: Effective writing skills, with humanities majors having the highest average scores;

H7: Effective speaking skills, with business majors having the highest average scores, and natural science majors having the lowest average scores;

H8: Mathematical skills, with natural science majors having the highest average scores, and humanities majors having the lowest average scores;

H9: Leadership skills, with business majors having the highest average scores and natural science majors having the lowest average scores;

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<sup>4</sup> I do not expect statistically significant differences among students by area of major in their self-perceptions of interpersonal skills.

H10: Computer skills, with business majors having the highest average scores, and humanities majors having the lowest average scores;

H11: Critical thinking skills, with humanities majors having the highest average scores, and business majors having the lowest average scores;

H12: Aesthetic skills, with humanities majors having the highest average scores;

H13: Knowledge of philosophical, religious, and social thought, with humanities majors having the highest average scores and business majors having the lowest average scores;

H14: Knowledge of the natural sciences, with natural science majors having the highest average scores;

H15: Knowledge of non-Western societies, with social science majors having the highest average scores;

H16: Knowledge of leading historical figures, with social science majors having the highest average scores and natural science majors having the lowest average scores;

H17: Knowledge of master movements in art, music, and literature, with humanities majors having the highest average scores and business majors having the lowest average scores; and

H18: Knowledge of social and behavioral sciences, with social science majors having the highest average scores.

#### C. Consistency of Results for Graduating Classes of 1992 and 1995

The final part of my analysis is to compare the average mean scores on each of the skill and knowledge items for the senior classes of 1992 and 1995. The purpose of

this comparison is to determine whether the results are consistent between two senior classes.

## V. Research Design

The data for this study were taken directly from the surveys administered as part of the ongoing assessment program at the university. Therefore, it is essential to understand how the sample of students was derived and how the data were collected. For the 1992 Senior Survey cited earlier, the Assessment Steering Committee sought, at minimum, a 25 percent random sample of the 1992 graduating class. The final sample was 290 students out of a population of 1,048, constituting a 28 percent random sample of the 1992 graduating class. The second cross-sectional sample, which was to become the first stage of a three-year panel study, was generated in 1993 when the respondents were sophomores. The same students were surveyed again for the 1994 Junior Survey and 1995 Senior Survey. The random sample derived for the 1993 Sophomore Survey was 402 out of a class of 1,218, a 33 percent random sample. The sample for the 1995 Senior Survey was 330.<sup>5</sup>

It is useful at this point to include a brief comparison of cross-sectional and panel survey designs. A cross-sectional study, which was used for the 1992 Senior Survey examines a sample of respondents at one particular time. The drawback to this type of

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<sup>5</sup> The total sample size for the 1994 Junior Survey was 346. There are complete data from all three surveys (1993, 1994, 1995) for 312 of the original 402 respondents. The sample of 330 reflects students who either completed all three years of the panel study, or were non-respondents for the 1994 Junior Survey, but still completed both the Sophomore and Senior Surveys.

survey is that a cross-sectional study can describe relationships between variables, but only at the particular time of the study (Babbie 1990). In contrast, a panel study consists of surveying the same sample at different points in time. The sample from the graduating class of 1995 is a panel study because the same students from this cohort have been surveyed several times: as sophomores in 1993, as juniors in 1994, and as seniors in 1995. The primary advantage to this type of research design is that it is "the most sophisticated survey design for most explanatory purposes" (Babbie 1990:59). This means that if there are changes reflected in the data over time, then the researcher may be able to account for some of the changes because the sample has not changed (Babbie 1990).

The next important part of the research design is data collection. Each year the survey has been implemented using telephone interviews conducted by other students at the university. These students who serve as interviewers are part of sociology Research Methods classes, which are taught by one of the members of the Assessment Steering Committee. As part of the course requirements, the students in this class are trained to conduct these interviews, and, in order to fulfill class requirements, each student is required to complete a certain number of interviews (normally 6 to 8).

With respect to validity, this study meets standards of content validity because the instrument covers a wide range of skills and knowledge, as shown in Appendix 2. This is consistent with the definition of content validity given by Babbie: "the degree to which a measure covers the range of meanings included within the concept" (1990:133). With respect to reliability, the questions concerning perceived skills and knowledge have been used since 1992 in these annual surveys, and the researchers have been able to recognize

consistent patterns of distribution among skill and knowledge items. The potential for researcher bias in the administering of these surveys has been addressed through the training of student interviewers, combined with the fact that the instrument is almost exclusively closed ended.

The data analyzed for this study are part of the university's assessment program, thus primary data analysis has been used. The data have been analyzed according to the categories presented in the formal hypotheses section, by gender, by area of major, and by the consistency of results in the 1992 and 1995 senior classes. However, regarding the area of major analysis, it should be mentioned at the outset that the analysis is limited to four broad areas of major because of the relatively small size of the sample in the present study. It is for this reason an analysis by specific concentration is impossible. The 1995 Senior Survey data were collected in March 1995 by undergraduates in the Research Methods course. Because the categories for analyzing the data are ordinal measures, with responses of self-perceptions ranging from 1 to 5, t-tests and one way analyses of variance were used in making comparisons of mean scores on respective items by gender and by area of major.

## VI. Data Analysis

In analyzing the data, means comparisons (t-tests and one way analyses of variance) were used to determine, first, whether statistically significant differences exist, respectively, by gender and area of undergraduate major, and second, whether the findings from the 1995 Senior Survey are consistent with the findings from the 1992 Senior Survey.

### A. Gender Analysis

Table 3 shows the comparison of means by gender for sophomores and seniors in the panel study. During the sophomore year, statistically significant gender differences were found in seven of fourteen items. Sophomore men rated themselves significantly higher than women in the following areas of skills and knowledge: computer skills, critical thinking skills, natural science knowledge, and knowledge of leading historical figures. Sophomore women rated themselves significantly higher than sophomore men in aesthetic skills, knowledge of art, music, and literature, and knowledge of social and behavioral sciences. During the senior year there were statistically significant differences on six of the fourteen items. Men rated themselves higher than women in mathematical skills, critical thinking skills, natural science knowledge, and knowledge of leading historical figures. Women in their senior year rated themselves higher than men in interpersonal skills, and knowledge of art, music, and literature. The areas which show consistent significant differences over time in the panel design are men's higher ratings



**TABLE 3**  
**SOPHOMORE (1993) AND SENIOR (1995) CLASS SAMPLES:**  
**COMPARISON OF MEANS ON GENERAL EDUCATION SKILLS**  
**AND KNOWLEDGE BY GENDER**

	SOPHOMORES (N=330)			SENIORS (N=330)		
<b>SKILLS</b>	<b>GENDER</b>			<b>GENDER</b>		
	MEN	WOMEN	SIG.	MEN	WOMEN	SIG.
Effective writing	3.58	3.63	NS	3.97	4.06	NS
Effective speaking	3.36	3.20	NS	3.79	3.84	NS
Mathematical	3.32	3.08	NS	3.61	3.35	.01
Leadership	3.44	3.46	NS	3.72	3.74	NS
Computer	2.81	2.44	.00	2.99	2.86	NS
Interpersonal	3.86	3.89	NS	3.91	4.12	.01
Critical thinking	3.85	3.62	.01	4.14	3.94	.02
Aesthetic	3.09	3.36	.01	2.72	2.90	NS
<b>KNOWLEDGE</b>	<b>GENDER</b>			<b>GENDER</b>		
	MEN	WOMEN	SIG.	MEN	WOMEN	SIG.
Philos/religious systems	2.74	2.60	NS	2.95	2.90	NS
Natural sciences	3.25	2.97	.02	3.19	2.89	.02
Non-Western societies	2.54	2.38	NS	3.09	3.04	NS
Leading historical figures	3.33	3.05	.01	3.16	2.87	.02
Art/music/literature	2.55	3.12	.00	3.02	3.56	.00
Social/behavioral science	2.96	3.18	.04	3.70	3.70	NS

Skill and Knowledge Levels: 1 = low to 5 = high

NS=difference is not statistically significant at the .05 level (T-tests)

in critical thinking skills, natural science knowledge, and knowledge of leading historical figures, and women's higher ratings in knowledge of art, music, and literature.

In analyzing the areas in which there were significant differences in the sophomore and/or senior years, several explanations can be offered. First, the literature suggests that women tend to define themselves in terms of their relationships with others (Gilligan 1982; Belenky, Clinchy, Goldberger, and Tarule 1986), so, compared with men, their relatively higher ratings on interpersonal skills may explain this trend. Additionally, both the literature and the sample taken for this study suggest that women are more likely to major in humanities and related fields (Thomas 1990). Because women are more likely to be represented in these fields, this may explain their higher ratings in terms of knowledge of art, music, and literature during both years, and aesthetic skills and knowledge of the social and behavioral sciences during the sophomore year.

To test for this effect, I regressed scores on these items in models that include both gender and area of major. With respect to knowledge of art, music, and literature in both sophomore and senior years, there are statistically significant gender differences ( $p < .005$  and  $p < .001$ , respectively) regardless of area of major. The same pattern holds for knowledge of social and behavioral sciences ( $p < .04$ ) and aesthetic skills ( $p < .11$ ) in the sophomore year, although the latter does not reach a .05 criterion of statistical significance. The conclusion is clear: while women may choose some areas of major or specific fields as opposed to others, such choices do not adequately explain gender differences in self-perceptions of general education knowledge and skills.

The higher ratings of men in terms of mathematical skills, computer skills, critical thinking skills, natural science knowledge, and knowledge of leading historical figures is consistent with previous research literature. All of the areas in which men rate themselves higher than women, with the exception of knowledge of leading historical figures, are related in some fashion to the concrete and impersonal ways of reasoning more likely to be associated with males (Baxter Magolda 1992). The first four skill and knowledge areas are all in some way associated with the discipline of natural science, which is more likely to be pursued by men than women at the college level (Thomas 1990). Even though the gender breakdown for the natural sciences area of major is approximately equal (42 men and 41 women), as mentioned earlier, women are disproportionately biology majors.

In terms of men having higher ratings than women in knowledge of leading historical figures, this explanation may be found in viewing the results of the Historical Knowledge Test given by this university in 1991. Because the item on the 1995 survey referred to leading historical figures, it is logical that these should be individuals who possess or have possessed a certain amount of power in society at some point in time. Therefore, in comparing this finding with the Historical Knowledge test, and its conclusion that "men are more knowledgeable than women about some (not necessarily all) kinds of power relations" (Kreps 1991:22), the difference may be explained.

Examining specifically the gender hypotheses noted above, Hypothesis 1 received modest support: there were fewer statistically significant differences during the senior (6 differences) as opposed to the sophomore (7 differences) years. Hypothesis 3 was also

supported: senior women rated themselves higher than senior men in knowledge of art, music, and literature. Hypotheses 2 and 4 were not supported: senior men did not rate themselves higher than women in terms of computer skills, and women did not rate themselves higher than men in terms of knowledge of social and behavioral sciences.

From this analysis, it is interesting to compare the similarities and differences between the original cross-sectional comparison (1993 Sophomore and 1992 Senior Surveys) and the longitudinal design (1993 Sophomore and 1995 Senior Surveys) by gender. As mentioned earlier, many of the gender differences found in the 1992 Senior Survey were not consistent with those found in the 1995 Senior Survey. One conclusion which may be drawn is that care must be taken in making longitudinal inferences from cross-sectional comparisons.

#### B. Area of Major Analysis

The next section of this analysis concerns area of major differences. Table 4 shows the comparison of means between sophomores and seniors by area of major. One way analyses of variance were used to determine statistically significant differences among students majoring in the humanities, natural sciences, social sciences, and business. In nearly every skill and knowledge area, during both the sophomore and senior years, there are statistically significant differences with respect to self-perceptions of skills and knowledge. The only items for which there were no statistically significant differences during the sophomore year were effective speaking skills, leadership skills, and critical thinking skills. During the senior year, the only areas showing no significant differences between students of different majors were interpersonal skills and critical thinking skills.

TABLE 4  
SOPHOMORE (1993) AND SENIOR (1995) CLASS SAMPLES:  
COMPARISON OF MEANS ON GENERAL EDUCATION SKILLS AND KNOWLEDGE  
BY AREA OF MAJOR

SKILLS	SOPHOMORES (N=305)					SENIORS (N=305)				
	I	II	III	IV	SIG	I	II	III	IV	SIG
Effective writing	4.02	3.69	3.42	3.16	.00	4.50	4.21	3.67	3.64	.00
Effective speaking	3.43	3.32	3.05	3.09	NS	3.89	3.95	3.45	4.09	.00
Mathematical	2.69	2.93	3.74	3.75	.00	2.96	3.21	4.01	3.93	.00
Leadership	3.52	3.43	3.36	3.45	NS	3.78	3.69	3.61	4.07	.05
Computer	2.22	2.52	2.84	3.09	.00	2.54	2.64	3.30	3.61	.00
Interpersonal	4.09	3.90	3.84	3.56	.01	4.19	4.02	3.94	4.07	NS
Critical thinking	3.61	3.80	3.78	3.45	NS	3.91	4.07	4.08	3.98	NS
Aesthetic	3.63	3.25	3.00	2.93	.00	3.50	2.74	2.65	2.27	.00
KNOWLEDGE	I	II	III	IV	SIG	I	II	III	IV	SIG
Philos/religious systems	2.96	2.81	2.38	2.25	.00	3.28	3.15	2.69	2.30	.00
Natural science	2.56	2.92	3.95	2.70	.00	2.26	2.69	4.37	2.48	.00
Non-Western societies	2.67	2.54	2.10	2.45	.00	3.54	3.20	2.77	2.77	.00
Leading historical figures	3.39	3.41	2.78	3.02	.00	3.28	3.31	2.54	2.82	.00
Art/music/literature	3.54	2.81	2.56	2.45	.00	4.41	3.27	2.95	2.64	.00
Social/behavioral sciences	3.22	3.27	2.79	2.81	.00	3.69	4.24	3.17	3.41	.00

Area of major: I = humanities, II = social science, III = natural science, IV = business  
NS = differences are not statistically significant (One-way analysis of variance)

It is perhaps not surprising that there should be statistically significant differences between students in nearly all of the skill and knowledge areas included in the instrument. As students become more specialized within a particular field or area, they develop knowledge bases which are reflected in particular items on the surveys. For example, it is not surprising that natural science majors have much higher ratings in natural science knowledge than students of other majors; similarly, it is not surprising that social science majors have higher ratings of knowledge of the social and behavioral sciences than do students majoring in other areas. The possibility also exists for differential socialization among students of different majors. As Weidman suggests: "The major field can be a powerful source of normative influence on student majors, in large part because of the faculty's ability to differentially reward students for their performance in courses, both through the assignment of grades and the encouragement of social interaction" (1989:97). Students may have different experiences from their peers who major in other areas. So, in addition to specialization effects, there is also a strong possibility of differential socialization within different majors. Also operating are the effects of students' self-selection into various areas of major which are identified early in students' careers before they choose a major field, and then persist until the senior year.

The more important question seems to be to explain the areas in which no statistically significant differences exist, in interpersonal skills and critical thinking skills. Even though all of the skill and knowledge items are considered equally important to the acquisition of a liberal education, one explanation for this finding is that these skills may be emphasized across all four areas of major. However, the remaining skill and

knowledge items may be emphasized to varying degrees across the four areas of major. For example, it is likely that mathematical skills are more strongly emphasized in Area III concentrations. (For a complete breakdown of specific concentrations by the four areas of major, see Appendix 1.)

Regarding the area of major hypotheses, with the exceptions of Hypotheses 11 and 15, all of the area of major hypotheses were supported. There was no statistically significant difference among students of different majors in terms of critical thinking skills. Humanities majors had the highest average scores regarding knowledge of non-Western societies, which differs from my hypothesis. Therefore, Hypotheses 5, 6, 7, 8, 9, 10, 12, 13, 14, 16, 17, and 18 were all supported through the analysis.

Just as with gender, it is interesting to compare the overall similarities between the original cross-sectional comparisons (1993 Sophomore and 1992 Senior Surveys) and those from the longitudinal design (1993 Sophomore and 1995 Senior Surveys) by area of major. In contrast to the inconsistency of gender differences from cross-sectional to panel designs, most of the same area of major differences found in the 1992 Senior and 1993 Sophomore Surveys were consistent with those found in the 1995 Senior Survey. It seems that patterns of difference are more robust over time, as determined by either cross-sectional or panel comparisons.

### C. Senior 1992/1995 Analysis

The final section of the analysis concerns the consistency of results for the senior classes of 1992 and 1995. For this analysis, each senior class was viewed as a whole, and sub-samples were not broken out by either gender or area of major. Table 5 shows

**TABLE 5**  
**COMPARISON OF OVERALL MEANS FOR SENIORS IN 1992 AND 1995**

SENIORS			
	1992	1995	
<b>SKILLS</b>	(N=290)	(N=330)	SIG.
Effective writing	3.99	4.02	NS
Effective speaking	3.47	3.82	.00
Mathematical	2.96	3.47	.00
Leadership	3.65	3.73	NS
Computer	2.66	2.92	.01
Interpersonal	4.04	4.02	NS
Critical Thinking	4.09	4.04	NS
Aesthetic	3.33	2.82	.00
<b>KNOWLEDGE</b>	(N=290)	(N=330)	SIG.
Philos/relig systems	2.76	2.92	NS
Natural sciences	2.82	3.02	.04
Non-Western societies	2.54	3.07	.00
Leading hist figures	3.38	3.01	.00
Art/music/literature	3.07	3.31	.01
Social/behav science	3.11	3.70	.00

Skills and Knowledge Levels: 1 = low to 5 = high

NS=difference is not statistically significant at the .10 level (T-tests)

Source: Bosworth (1993), 1992 Senior Survey and 1993 Sophomore Survey



a comparison of the overall means for each of these senior classes and t-tests were used to identify any statistically significant differences. The results from these tests were surprising, given that the two surveys were completed within a three year period of time. Although there were some areas which showed no statistically significant difference by graduating year, nine of fourteen items did so. The five items that showed no statistically significant difference between the 1992 and 1995 Senior classes included: writing skills, leadership skills, interpersonal skills, critical thinking skills, and knowledge of philosophical and religious systems. The remaining nine items that showed statistically significant differences included: speaking skills, mathematical skills, computer skills, aesthetic skills, knowledge of natural sciences, knowledge of non-Western societies, knowledge of leading historical figures, knowledge of art, music, and literature, and knowledge of social and behavioral sciences. The 1992 Seniors rated themselves higher only in terms of aesthetic skills and knowledge of leading historical figures. The 1995 Seniors rated themselves higher in effective speaking skills, mathematical skills, computer skills, natural science knowledge, knowledge of non-Western societies, knowledge of art, music, and literature, and in knowledge of the social and behavioral sciences.

It appears that members of the 1995 graduating class have greater self-confidence in their general education skills and knowledge. A possible explanation is that seniors from 1995 have been provided more experiences aimed at improving selected skills and knowledge, as is the case at this university with speaking and computer skills. Another way to explain differences in the two senior classes is more contextual. An individual's college experience does not occur in a vacuum, and it is influenced by external forces and

events. During the course of the two cohorts' college careers, there may have been cultural developments which were more predominant in one year than another. For example, seniors in 1995 rated themselves more knowledgeable about non-Western societies than did the class of 1992. One explanation for this finding is that there has been an increased emphasis on multiculturalism and diversity at the societal level. Evidence of this societal effect is that enrollment in courses with a non-Western focus has increased in recent years.

Still another explanation may be that the populations of students from which the 1992 and 1995 Seniors were drawn were different on some important characteristics. Although it is not possible to identify all of the ways these two samples of students might have varied, some variables which may show difference may be obtained through university records (University Data Book 1992-1993). For example, records from this university show that the Scholastic Aptitude Test (SAT) scores for the entering classes of 1988 and 1991 were slightly different: the mean SAT score for the freshmen in 1988 was 1229, and the mean SAT score for the freshmen in 1991 was 1239. The distribution of class rank for the entering freshmen of 1988 and 1991 was also somewhat different. In terms of class rank, 58.9% of freshmen entering in 1991 graduated in the top tenth of their high school classes, compared with 65.8% of the entering class of 1988.<sup>6</sup>

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<sup>6</sup> The entering classes of 1988 and 1991 are the cohorts of students who presumably graduated in 1992 and 1995, respectively. This university has a graduation rate for entering classes that approaches 90 percent.

## VII. Conclusion

This thesis has detailed a study of self-perceptions of skills and knowledge among different samples using assessment data from a mid-sized university in the mid-Atlantic region. All aspects of the research process were considered, including background of the study, literature review, formal hypotheses, research design, and data analysis. This study is of both practical and methodological value.

In comparing students' self-perceptions of skill and knowledge by gender, the results are both encouraging and discouraging. One of the most encouraging findings from this study is that in the panel study, there were slightly fewer gender differences during the senior year than during the sophomore year. Also encouraging is that the data indicate that in some skill and knowledge areas, gender differences which exist during the sophomore year are not sustained through the senior year. These areas include the following: computer skills, aesthetic skills, and knowledge of the social and behavioral sciences. In contrast, some of the findings from this study are less encouraging in terms of diminishing gender differences during the college years. In a few skill and knowledge areas, significant gender differences not present during the sophomore year emerged during the senior year. Men had higher self-perceptions in mathematical skills during the senior year, and women had higher ratings in interpersonal skills during the senior year.

The emergence, maintenance, as well as disappearance of gender differences during the college years may be partially explained by the theoretical literature on

socialization presented earlier. Although it is difficult to explain each area which showed a significant gender difference, the results suggest that the socialization experiences of both men and women change over time. Taking computer skills, for example, one explanation for the decreasing gender difference in this area might be that in the university setting, females are socialized through their studies to become more proficient in computer skills. Similarly, sophomore men, who had lower ratings in knowledge of the social and behavioral sciences, may have been socialized through their college experiences to become more knowledgeable in this area.

It is also possible that these differences which appear in this analysis as gender differences may also be mediated by other variables, such as an individual's area of major. Recall that the sample was intentionally stratified by gender but is also representative of the population with respect to area of major. It should be noted that some gender differences exist across and within area of major. For example, women majoring in humanities outnumber men by two and one half times, and women majoring in the natural sciences are disproportionately biology majors.

In comparing self-perceptions of students in each of the four areas of major, the results are relatively consistent. On every skill and knowledge item, except critical thinking skills, significant differences by area of major exist for each item during either the sophomore year, the senior year, or both. This general finding relates to the literature primarily in terms of the specialization in skills and knowledge which occurs in different majors. Weidman (1989) suggests that there is an underlying process of socialization which occurs once students enter an area of major. The effects of these specialized

socialization processes may explain the significant differences in nearly every skill and knowledge area.

The final comparison provided by this study is the lack of consistency of self-perceptions of skill and knowledge during a period of three years. One explanation which relies on the theoretical argument presented earlier is that the processes which make up socialization may have changed from 1992 to 1995. Different issues affect cohorts of students over time, so that the salient issues affecting the graduating class of 1992 are not the same as the issues affecting the graduating class of 1995. With constantly changing issues dominating the media and the university, different aspects and processes of socialization are affected, resulting in changes over time. For example, one such change is the increased focus on diversity and interest in other cultures. This may help to explain the higher self-perceptions of 1995 Seniors in knowledge of non-Western societies.

The overall analysis of gender, area of major, and consistency of results from 1992 and 1995 also revealed important information regarding the comparison of cross-sectional and panel data. Since the results comparing the two classes (1992 and 1995) showed significant differences on a majority of items over time, this supports the notion that two cross-sectional studies (1993 Sophomore and 1992 Senior Surveys) do not necessarily reveal the same information as a panel design. Similarly, the analysis of gender differences in the cross-sectional and longitudinal studies showed that the skills and knowledge items showing significant differences were not consistent over time. However, in comparing the cross-sectional and longitudinal data for students by area of major, the results showed more consistency in each of the classes surveyed. Taken together, these

analyses further suggest that caution should be taken when attempting to draw conclusions based on the passage of time, when time is not truly operating as the independent variable.

In addition to the results produced specific to this research, this study's usefulness has broader implications. The study is beneficial because it can be used to determine how representative the population of students at this university is of the general college population. Comparisons of the findings from this study with similar studies among different populations of college students make this possible. For example, Astin (1993) has done extensive research on national samples of college students. Because this type of data exists, it is possible to compare the findings from national data with the findings from this study to determine how representative the students at this mid-sized, mid-Atlantic university are of the general population of college students.

This research also benefits the university. Members of the Assessment Steering Committee can develop insights about how students assess their own development of knowledge and skills over time. The Assessment Steering Committee can then draw some conclusions about undergraduates at this university and how they perceive themselves to meet the general education goals of the university. Based on these conclusions, appropriate changes may be made to enhance development in certain skills and knowledge areas. Subsequent panel designs can help to determine if curricular changes are making a difference.

The analysis suggests that there are several areas which need to be explored further. First, with respect to gender differences, although socialization is one explanation

for them, possibilities for alternative explanations for these differences should be examined. For example, a more thorough analysis of the feminist literature may prove to be fruitful. When other conceptual frameworks are combined with socialization, the result may be a more complete explanation of why gender differences in self-perceptions continue throughout college. Future research in the area of undergraduate major, and the dramatic self-perception differences found in examining this variable, might take a direction which examines the specific processes at work in each of these broad areas of major. Researchers could attempt to understand not only what the differences are, but the processes which are at work within each of the majors.

Finally, this study makes a contribution to the sociological literature in the fields of gender and education. With respect to gender, this study serves to illustrate some of the similarities and differences between men and women in terms of self-perceptions as individuals play the role of college student. It also illuminates the areas in which gender differences are developing, diminishing, or remaining constant. This study replicates some of the gender and area of major differences, particularly in terms of self-perceptions, which have been found through previous research. With respect to the sociology of education, this study has been useful because it combines students' self-perceptions of both cognitive and noncognitive areas of development. Additionally, other researchers can undertake similar research regarding self-perceptions of skills and knowledge for different types of institutions of higher education. Although this study has contributed useful analytical information and empirical data to the research literature, there remain several areas discussed above which need to be explored in future research efforts.

## APPENDIX 1

### Specific Undergraduate Majors\* within the Four Broad Areas of Major

#### Area 1: Humanities

Classical Studies  
Comparative Literature  
Dance  
English  
Fine Arts  
Modern Languages  
Music  
Philosophy  
Religion  
Theatre

#### Area 2: Social Sciences

Anthropology  
Economics  
Education  
Government  
History  
Kinesiology  
Psychology  
Sociology

#### Area 3: Natural Sciences

Biology  
Chemistry  
Computer Science  
Geology  
Mathematics  
Physics

#### Area 4: Business

Business

\* Interdisciplinary concentrations were classified with the most appropriate broad area of major, or excluded from the analysis.



## APPENDIX 2

### Areas of Skills and Knowledge to be Examined in the 1995 Senior Survey

#### SKILLS

Writing Skills  
Oral Communication Skills  
Decision-Making Skills  
Critical Thinking Skills  
Computer Skills  
Leadership Skills  
Interpersonal Skills  
Quantitative Skills  
Aesthetic Skills (i.e. understanding of  
creative processes & media)

#### KNOWLEDGE

Natural Science Knowledge  
Social Science Knowledge  
Historical Knowledge  
Knowledge of Other Cultures  
Knowledge of Literature and the Arts  
Knowledge of Philosophical, Religious, &  
Social Thought

## APPENDIX 3

### GENERAL EDUCATION OBJECTIVES

According to its "Statement of Purpose,"<sup>1</sup> [the university] is an institution of "liberal education." Since [the university] is committed to assessing the degree to which its students are receiving a "liberal education," it is important to articulate that concept. Part I presents such a statement.

In addition to endorsing the general ideal of a "liberal education," [the university's] mission statement also enumerates specific aims which constitute elements of a liberal education. Since these aims are too general to be used as the basis for assessment, Part II presents goals which can serve the assessment process and are consistent with the aims agreed upon in the Statement of Purpose.<sup>2</sup>

Both parts of the following statement of purposes and goals are based upon several assumptions:

1- They discuss only the general education aspects of liberal education, omitting the specialized skills and knowledge that fall within the purview of the fields of academic concentration. However, general education takes place throughout the college experience, including courses within the concentration, and is definitely not confined to specific non-concentration courses nor to the first two years of the curriculum.

2- Every liberally educated graduating student should possess the skills, knowledge, and values enumerated in the statement. Setting these goals, therefore, has been guided by a level of expectation which every student can be reasonably expected to meet. This will clearly set significant limitations on the depth of knowledge and the degree of proficiency which the student must meet in each area. For that reason, for example, the statement specifies that the student should be required to know only the most significant and important ideas drawn from the wide range of listed subjects, and this point is illustrated by the use of representative examples. It is definitely not the case that the student would be expected to take a college level course in each of the specified fields.

3- The four-year college curriculum does not bear the full burden of preparing students to meet these goals. Most students will bring much of the required skills, values, and knowledge with them upon entrance. In addition, liberal education takes place not only in the classroom, but also in the broader academic community mentioned so prominently in the Statement of Purpose. As a residential college, [the university] contributes to the education of our students at lectures, in the library, with informal

student and faculty meetings, at cultural events, and in a vast range of other extra-curricular activities.

## PART I - PURPOSES OF GENERAL EDUCATION IN A "LIBERAL EDUCATION"

A- Individual Autonomy: To prepare for life as an individual capable of making open-minded, reasoned, and informed choices of one's values, goals, and career. In support of this ideal, liberal education broadens one's perspective, making possible the evaluation of personal beliefs and values in the light of alternative points of view.

B- Social Responsibility: To acquire a sensitivity to the consequences of one's life and conduct for other people and for our natural and social environments.

C- Personal Fulfillment: To prepare for a fulfilling life, one rich in the satisfactions derived from art, music, literature, science, and the other achievements of culture. A liberally educated person experiences the joy of learning and discovery in all realms of life.

D- Cultural Literacy: To gain the background knowledge and other skills necessary for understanding written and oral communication from a wide range of sources, particularly those which are recognized as constituting the main-stream of our political, cultural, business, and artistic worlds. Similarly, to acquire the knowledge and skills necessary for communication to such an audience.

E- Political Autonomy: To prepare for responsible citizenship in a democracy. This requires understanding of the issues to be decided by the political process and an ability to make informed, rational choices among alternative policies, either directly or by election of representatives committed to those goals. Ideally, many individuals will have the desire and the ability to participate personally in governance at some level, which would require the aforementioned skills to a high degree along with the ability to communicate one's views effectively and persuasively to others.

F- Life and Career Enhancement: To acquire the broad-based, non-professional, higher-order skills that enable the individual to flourish in a wide range of careers or other endeavors. With these skills, the liberally educated graduate:

- 1-can perform particularly well within specific jobs or professions,
- 2-can adapt to new developments within those vocations,
- 3-can enter completely new fields,--thus enhancing his or her occupational options and prospects, and
- 4-can similarly flourish in and adapt to new social and other non-professional environments.

## PART II- SPECIFIC KNOWLEDGE, SKILLS, AND VALUES<sup>3</sup>

To achieve the aims of liberal education, [the university] has set general goals, which are identified in the Statement of Purpose. Since [the university's] assessment program emphasizes the evaluation of student outcomes, it is necessary to restate these aims as more specific knowledge, skills, and values objectives.

### A- Knowledge Objectives<sup>4</sup>

1- A general understanding of the world of nature and the major achievements of astronomy, biology, chemistry, geology, and physics.

Examples: the major features of modern evolutionary theory and genetics and the ability to describe our solar system, galaxy, and universe with knowledge of their size and time scales.

2- An understanding of individual and social behavior and the fundamental concepts employed in anthropology, economics, political science, sociology, and psychology as they contribute to that understanding.

Examples: the principal concepts of Marxist and capitalist economic theory, of twentieth century psychology, i.e., neuroses, repression, sublimation, and the fundamental insights of some influential social and political theorists.

3- A general historical knowledge of seminal events, movements, and ideas that have shaped Western civilization and our nation.

Examples: ancient Greek democracy, the Renaissance, the Reformation, the American and French revolutions, the American Civil Rights movement, the Women's Rights movement.

4- Acquaintance with a non-Western cultural tradition, for example, classical China, and African tribal society, or India in the twentieth century.

Examples: India during the Golden (Gupta) Age, China in the T'ang and Sung dynasties, the Aztec civilization, Japan under the Shoguns.

5- A general knowledge of masterworks, genres, and movements in art, music, and literature.

Examples: Classical and Gothic architecture; Baroque and Romantic music; Neo-Classical, Impressionist, and Cubist painting; and selected works of

Dante, Shakespeare, Goethe, Moliere, and Jane Austin.

6- A general knowledge of major philosophical and religious systems which seek to define what it means to be human, including visions of the good life and of our human destiny.

Examples: the contributions of the Hebrew prophets, Plato, St. Thomas Aquinas, Gautama Buddha, Rousseau, and Nietzsche.

## B- Skills Objectives<sup>5</sup>

### 1- Critical Thinking Skills

- a- To demonstrate an ability to reason deductively (as in mathematics and formal logic).
- b- To demonstrate an ability to reason inductively (as in formulation of general laws of science, informal generalization, sound use of statistics).
- c- To demonstrate sensitivity to typical forms of fallacious reasoning (such as guilt by association, over-reliance on authority, ad hominem reasoning, and equivocation).

### 2- Verbal Skills

- a- To write clear and effective prose, with sub-skills of:
  - i- writing informatively
  - ii- writing persuasively
  - iii- observing grammatical and stylistic norms
  - iv- following canons of sound reasoning.
- b- To speak clearly and communicate effectively.
- c- To understand the communications of others.
- d- To understand levels of meaning (such as literal, figurative, and mythological).

### 3- Quantitative Skills

- a- To use mathematics to solve problems and support arguments, with sub-skills of:
  - i- using algebra in the solution of problems
  - ii- understanding the concepts of similarity and proportionality
  - iii- using graphs and charts to represent numerical data
  - iv- understanding the elementary concepts of statistical analysis and probability.
- b- To understand arguments of others that are based upon numerical information, concepts of algebra or elementary statistics.

#### 4- Scientific Skills

- a- To demonstrate the ability to distinguish conjectures that are testable by scientific methods from those that are not, and to suggest appropriate experiments or observations.
- b- To apply the principles of experimental design, including:
  - i- a reduction in the number of variables
  - ii- the elimination of uncontrolled variables
  - iii- constructing and testing hypotheses.

#### 5- Aesthetic Skills

To demonstrate a familiarity with the products of artistic traditions, an awareness of critical standards, and an understanding of creative processes and media.

#### 6- Historical Inquiry Skills

To demonstrate the ability to apply the principles of historical inquiry, which emphasize verification through critical analysis and comparison of texts and archives.

#### 7- Language Skills

To demonstrate proficiency in at least one foreign language.

#### 8- Information Acquisition Skills

- a- To determine the kind and amount of information needed for an inquiry.
- b- To locate useful information through the use of libraries and other resources, such as computerized data-bases.

#### 9- Computer Literacy

To understand the capabilities of computers for word processing, analysis of data, and simulation.

### C- Attitudes and Values Objectives<sup>6</sup>

#### 1- Intellectual Values

- a-Intellectual integrity.
- b-Intellectual curiosity and commitment to continued learning.
- c-Openness to a diversity of viewpoints.
- d-Disposition to seek and assess appropriate evidence for assertions.

- e-Recognition of the limits of human knowledge and reasoning, and a willingness to act where rational certainty is unavailable.
- f- Respect for various intellectual modes of inquiry and of understanding.
- g-Disposition to employ multidisciplinary knowledge and skills to analyze complex issues.

## 2- Social and Civic Values

- a-Commitment to social and civic responsibility.
- b-Tolerance and respect for diversity in society (i.e., disposition to respond with fairness, compassion, and open-mindedness to individuals and groups with different characteristics, such as race, religion, gender, and social status).
- c-Respect for the role of legitimate rules and processes within a democratic society that protect individual and group rights.
- d-Sensitivity to the importance of the natural environment.
- e-Disposition toward social interactions which enhance a sense of community.

## 3- Personal Attitudes and Values

- a-Development of autonomously held and rationally defensible moral values.
- b-Development of aesthetic sensibilities and concerns.
- c-Positive sense of self and personal identity.
- d-Attitudes and habits conducive to physical and psychological health.

## NOTES

1. As part of the 1984 Self-Study, [the university] adopted a "Statement of Purpose." This mission statement was formally approved by each of the faculties, the Student Association Council, the Board of Directors of the Society of the Alumni, and the Board of Visitors. The statement was printed in the Report of Self-Study and also appears in each edition of the Undergraduate Program Catalog.
2. To demonstrate the relationship of the items on the new list to those enumerated in the present "Statement of Purpose," the correspondence of each of the goals to those mentioned in the current Statement is noted in endnotes.
3. The following list of knowledge, skills, and values outcomes constitutes a continuum of overlapping and generally inseparable attributes that we believe characterize a liberally educated person. They are listed separately here only to facilitate discussion and the design of measurement instruments.
4. These knowledge objectives are derived from the following general aims of [the university's] "Statement of Purpose": "The curriculum makes accessible to students the substance of existing knowledge and the contemporary disciplines of thought and investigation by which knowledge is required." "Participation in the community results...in a breadth of view that comprehends what each discipline means to the others."
5. These skills objectives are derived from the following general aims of [the university's] "Statement of Purpose": "...the curriculum seeks to develop those abilities that characterize a liberally education mind: literacy, a command of language and sound argumentation in speech and writing; mathematical and scientific methodology...appreciation of the creative arts as an ordering and expression of human perceptions..." "...the undergraduate program fosters the aim of liberal education: the development of that critical and creative intelligence through which men and women realize their human potentialities..." "Research, a fundamental activity of the community, is...integral to the student's program." "The life of the community depends upon...essential resources of learning, such as libraries, laboratories, studios, and computers."
6. These values objectives are derived from the following general aims of [the university's] "Statement of Purpose": "The curriculum seeks to develop...the ability to recognize and examine the values which infuse thought and action." "An athletic program emphasizing the development of each student's physical skills and sense of sportsmanship complements a program of liberal education."



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